Working Paper Series

Working Paper No. 440

MODELLING STRUCTURAL ADJUSTMENT IN THE U. S. ECONOMY:
MACROECONOMICS IN A SOCIAL ACCOUNTING FRAMEWORK

by

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RESOURCE ECONOMICS

BERKELEY

CALIFORNIA AGRICULTURAL EXPERIMENT STATION

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April, 1987

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April 1987

A Shorter version of this paper was presented at the annual meetings of the American Economic Association, New Orleans, December 1986.

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Modelling Structural Adjustment in the U.S. Economy: Macroeconomics in a Social Accounting Framework

Sherman Robinson and David W. Roland-Holst

1. Introduction

The U.S. economy has undergone a number of shocks in the last two decades. These include large swings in the price of oil, large changes in world capital flows, major swings in macro balances (increasing deficits in the government and balance of payments accounts, as well as savings-investment imbalances), and major changes in world trade patterns. Many of these shocks have been "structural" in the sense that they have directly affected relative prices and/or have caused changes in the composition of demand and supply.

In this period, macroeconomic shocks have also had important structural implications. For example, the revealed macro policy of the past six years has involved increasing government deficits (due both to increases in expenditure, mostly military, and to decreases in tax revenue) financed largely by foreign borrowing. The macro results have been large foreign capital inflows and very large deficits in the balance of trade. The impacts of these changes on the sectoral structure of production, exports, imports, and domestic demand have been profound and difficult or impossible to foresee.

Associated with the structural changes have been major shifts in relative prices. In the early 1980s, the macro policy mix led to an effective revaluation of the dollar and high U.S. real interest rates. These, in turn, led to major changes in relative factor and product prices; in particular, a significant decrease in the average relative prices of tradables to non-tradables

(the real exchange rate), which shifted incentives away from exporting, toward importing and the production of non-tradables. More recently (in 1986), there has been a large effective devaluation of the dollar, with concomitant swings in relative domestic prices.

Most of the macroeconomic literature has focused on problems of macro adjustment; i.e., inflation, changes in aggregate employment, and balance among the macro aggregates. However, there appears to be a serious lack of attention to problems of "structural adjustment." Since the first oil shock, problems associated with achieving compositional changes in sectoral supply and demand of factors and products in response to changes in relative prices and incentives have been at least as serious as those associated with achieving macro balance. Indeed, the interactions between macro adjustment and structural adjustment need to be considered in any adequate policy analysis of the current U.S. situation.

Currently, the field of macroeconomics seems to be in disarray. Wide gaps have appeared between theory, stylized facts, and empirical practice. There is widespread dissatisfaction in the econometric community with the performance of macroeconometric models. We believe that this poor empirical performance results from the inability of such models (either monetarist or Keynesian) to capture the structural features of a market economy adjusting to the sorts of shocks discussed above, including shifts in both demand composition and relative prices. On the other hand, recent work in macro theory appears to be seeking a simpler world in which macro adjustment is not a problem or, if it is, nothing can be done anyway. While these theoretical exercises sharpen our understanding of particular models, especially focusing on the

role of expectations, they do not consider the workings of a multisectoral, multi-market, general equilibrium system undergoing structural adjustment.

In this paper, we describe an economywide modeling framework based on a Social Accounting Matrix that has been used in developing countries to explore the interactions between macro policy and structural adjustment. Using multiplier analysis, we illustrate how this framework can capture the essential structural features of the economy and sort out the direct and indirect links through which macro shocks affect the system. We present a new multiplier decomposition methodology that measures the importance of these links and apply it to U.S. data. We also present a methodology for analyzing structural adjustment and apply it to U.S. data for the 1982-1985 period.

2. Macroeconomic Modelling in a Social Accounting Framework

The starting point for all multisectoral models is the input-output accounting tableau, which captures linkages through flows of intermediate inputs. While providing sectoral disaggregation, an input-output model does not include enough institutional detail to provide a framework for considering the impact of macro shocks on economic structure. The model can be extended to capture income and expenditure flows among major actors in a Social Accounting Matrix (SAM). The development of SAMs was partly motivated by the desire to provide a unified framework reconciling the national income and product accounts, on which all macro models are based, with the input-output accounts.[1]

[1]The original work on SAMs was largely due to Sir Richard Stone. See Stone (1966) and Pyatt and Round (1985).

The basic aggregate macroeconomic accounts consist of a set of five balance equations:

(1) $Y = C + Z + G + E - M$

(2) $Y = C + S^H + T$

(3) $Z = S^H + S^G + F$

(4) $T - G = S^G$

(5) $M - E = F$

where: Y = GNP, C = consumption, Z = investment, G = government expenditure, E = exports, M = imports, S^H = household savings, S^G = government savings, T = taxes, and F = the balance of trade. These macro equations can be grouped into a macro SAM as follows:

Figure 1: A Macroeconomic Social Accounting Matrix

	Expenditures:				
Receipts:	(1)	(2)	(3)	(4)	(5)
1. Suppliers	A	C	Z	G	E
2. Households	Y	0	0	0	0
3. Capital account	0	S^H	0	S^G	F
4. Government	0	T	0	0	0
5. Rest of the world	M	0	0	0	0

The entry A represents total intermediate flows, which are netted out of the macro balance equations. A SAM is always square, with the receipt row and expenditure column for each account balancing. Thus any model based on the SAM satisfies Walras' Law. The five equations state the summing up properties of the SAM --column sums equal row sums.

The SAM includes two types of entries. First, there are nominal flows for which there are corresponding real flows across product and factor mar-

kets. In this SAM, all the entries in the "suppliers" account are of this type. Suppliers pay all factor income (Y) to households, while all the other entries in the row and column reflect payments for goods in the product markets. Second, there are nominal flows for which there are no corresponding real flows. In this SAM, all the entries other than those in the first row and column are of this type. They represent "financial flows" outside of the factor and product markets.[2]

While not part of the "productive sphere" of the economy, these financial flows reflect the institutional structure of the economy and need to be captured in macro models. For example, the entries in the row for the capital account (row 3) indicate the sources of savings. In this SAM, the capital account represents the loanable funds market, with savers (domestic and foreign) providing funds along the row which are then used to purchase investment goods in the column. This account summarizes the workings of the financial system and captures the essential fact that the actors who save are not the same as those who purchase investment goods.[3] In this SAM, the only other financial flow is tax receipts (T). More detailed SAMs usually include transfer payments, which can be seen as "inter-institutional" financial flows.

All macroeconomic models are essentially based on this accounting framework. In classical and neoclassical models, in which labor and product markets work perfectly, aggregate output (and income), Y, is assumed to remain

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[2]Another way to make the distinction clear is to note that these "financial flows" are not "productive" in that they do not enter value added or GNP.

[3]In more elaborate models, it is feasible to disaggregate the capital account. Note also that savers are presumably purchasing assets (bonds, new stock issues, or money), but the SAM here does not keep track of them. Again, it is feasible to extend the SAM framework to include asset balances as well as financial flows.

always at the full-employment level. In this case, the macro "problem" is only compositional, involving the determination of the mix between aggregate macroeconomic balances: consumption, investment, government, and trade. On the other hand, in a simple Keynesian world with unemployment, there are no supply constraints and changes in macro balances and financial flows have a strong feedback effect on aggregate income and output through demand multipliers. Between these two extremes, there is a continuum of models that allow macro feedbacks on the real economy, all of which assume various kinds of "structuralist" constraints on the ability of the economy to adjust fully to a shock through variations in sectoral prices, supply, and demand.

While a simple Keynesian demand-driven model is clearly not an adequate representation of a real economy, the multiplier analysis that the Keynesian framework supports can indicate the major structural linkages in the economy. Structural demand analysis of both real and financial flows is an important part of the story that has been neglected in recent years, which is especially troubling given the major swings in the structure of demand and financial flows that have occurred.

Following the approach of input-output models, a linear multiplier model can be constructed by assuming that all the expenditure (column) coefficients in the SAM are constant. Since the SAM is square and the coefficients in every column sum to one, the resulting coefficient matrix is singular. A complete specification of the model therefore requires that some accounts be designated as exogenous, excluding the corresponding rows and moving the columns out of the SAM. The choice of which accounts to make exogenous corresponds to a particular macroeconomic model, or macro "closure," and must be justified on

the basis of the problem under study.[4] Obvious candidates are one or more of the capital, government, and rest-of-the-world accounts.

Given the large swings in foreign trade and government expenditure during the early 1980s, a reasonable choice of macro closure for a model of the U.S. is to make the government and rest-of-the-word accounts exogenous and keep the capital account endogenous. In this case, the government deficit (G - T) and the balance of trade (M - E) are handled outside of the model, since both G and E are then exogenous. The result is a demand-driven multiplier model designed to focus on structural adjustment of the economy to shocks arising from changes in government expenditures, exports, the balance of trade (foreign savings) and the government deficit.

Investment, on the other hand, is determined endogenously and can be seen as savings-driven. Whatever is saved will be spent on investment goods (Z). The "leakages" in this model (from the endogenous to the exogenous accounts) include imports and taxes. Given a shock, the model determines new levels of economic activity, income, consumption, savings, and investment. At the new equilibrium, the change in aggregate leakages (changes in T and M) will just equal the aggregate shock (changes in G, E, S^G, and F).

In moving to a SAM multiplier model, it is useful to add sectoral detail to the supplier accounts and also to expand the household accounts to include households of different types. The resulting model is structural in that it captures compositional effects of macro shocks, as well as their aggregate

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[4]An analogous problem of macro closure arises in computable general equilibrium (CGE) models, with alternative macro closures corresponding to different views of how macro balance is achieved. For a discussion, see the survey by Robinson (1986).

impact. The expanded SAM model, with the accounts for the government and the rest of the world given exogenously, takes the form:

$$(6) \qquad y = \begin{bmatrix} A & C & Z \\ Y & \emptyset & \emptyset \\ \emptyset & S^H & \emptyset \end{bmatrix} y + x = Sy + x$$

where now the letters denote coefficient matrices from the corresponding accounts in the SAM, y is the vector of endogenous variables, and x is the vector of exogenous variables. The matrix S is square, with (n + m + 1) rows and columns. A is an (n,n) input-output matrix, Y is a (m,n) matrix of income payments from activities to households, C is an (n,m) matrix of household consumption coefficients, S^H is a (1,m) vector of savings coefficients, and Z is a (n,1) vector of investment expenditure coefficients. The vector x consists of the sum of the last two columns in the SAM and includes the sum of sectoral government expenditure and exports (a vector) and the sum of net government and foreign savings (a scalar). Solving the model yields:

$$(7) \qquad y = [I - S]^{-1} x = Mx$$

where M is the multiplier matrix. The matrix M provides the basis for analyzing the impact of macroeconomic shocks, capturing structural detail in both the real and financial accounts.

3. Decomposition of Macroeconomic Effects

This section presents a methodology of structural analysis applied to the SAM. Two approaches are considered: (1) a decomposition of macro transmission mechanisms, and (2) a decomposition of structural adjustment that separates aggregate and compositional changes.

3.1 Decomposing Multipliers

The macro effects captured by the multiplier matrix can be decomposed into various elements reflecting different types of macro linkages in the economy.[5] The endogenous accounts are partitioned into two groups. The first includes the factor and product markets --the real side of the economy-- and consists of the supplier and household accounts. The first partitioned square block on the main diagonal represents physical production, income generation, and the feedback through household consumption expenditure. The second group captures financial flows and, in this case, consists only of the capital account, representing the loanable-funds market which channels savings into demand for investment goods. The second partitioned square block on the main diagonal consists of inter-institutional financial flows, which are all zero for this SAM and choice of closure.

Given the partition, the SAM coefficient matrix can be written as the sum of two matrices:

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[5]There are many ways to decompose SAMs. Our approach is analogous to a decomposition procedure proposed by Stone (1981) and Pyatt and Round (1979), although our focus on macro links leads to significant differences. Adelman and Robinson (1986) apply the Stone-Pyatt-Round decomposition procedure to analyze linkages between agriculture and the rest of the U.S. economy.

(8) $S = S_1 + S_2$

$$S_1 = \left[\begin{array}{ccc|c} A & & C & \emptyset \\ Y & & \emptyset & \emptyset \\ \hline \emptyset & & \emptyset & \emptyset \end{array}\right] \qquad S_2 = \left[\begin{array}{ccc|c} \emptyset & & \emptyset & Z \\ \emptyset & & \emptyset & \emptyset \\ \hline \emptyset & & S^H & \emptyset \end{array}\right]$$

Note the structure of the partitioned matrices. The first is block diagonal while, in the second, only off-diagonal blocks are non-zero. The first captures within-block transactions while the second captures flows between the two blocks. The links between the real and financial blocks are given by financial flows in the lower left-hand rectangle which then lead to a demand for goods in the upper right-hand rectangle. In general, these can be seen as "macro links," balancing savings and investment in this case. For alternative choices of macro closure, one might include macro links to reconcile government expenditure and receipts or the balance of trade.

The multiplier equation can now be written as:

(9) $y = (I - D)^{-1} (I - S_1)^{-1} x$

where

(10) $D = (I - S_1)^{-1} S_2 = \begin{bmatrix} \emptyset & \emptyset & D_{13} \\ \emptyset & \emptyset & D_{23} \\ \emptyset & D_{32} & \emptyset \end{bmatrix}$

Using the series expansion of $(I - D)^{-1}$, equation 9 can be written as:

(11) $y = (I - D^2)^{-1} (I + D) (I-S_1)^{-1} x = M_3 M_2 M_1 x$

Equation (11) provides a decomposition of the overall multiplier matrix, M, into three multiplicative components.[6] In terms of the original coefficient matrices these components take the form:

$$M_1 = \begin{bmatrix} \mu_1 & C\mu_2 & \emptyset \\ Y\mu_1 & \mu_2 & \emptyset \\ \emptyset & \emptyset & I \end{bmatrix} \qquad \begin{aligned} \mu_1 &= [I - (A + CY)]^{-1} \\ \mu_2 &= Y\mu_1 C = Y[I - (A + CY)]^{-1}C \end{aligned}$$

$$M_2 = \begin{bmatrix} I & \emptyset & \mu_1 Z \\ \emptyset & I & Y\mu_1 Z \\ \emptyset & S^H & I \end{bmatrix}$$

$$M_3 = \begin{bmatrix} \emptyset & \mu_1 Z S^H \gamma_1 & \emptyset \\ \emptyset & \gamma_1 & \emptyset \\ \emptyset & \emptyset & \gamma_2 \end{bmatrix} \qquad \begin{aligned} \gamma_1 &= [I - Y\mu_1 Z S^H]^{-1} \\ \gamma_2 &= [I - S^H Y \mu_1 Z]^{-1} \end{aligned}$$

Note that the structure of the three multiplicative components resembles that of the additive decomposition, S_1 and S_2. The first component, M_1, is block diagonal and measures the "own effects" linkages within the two blocks of accounts. Given the partition of the SAM, this component captures links between production, income, and consumption within the real block, with μ_1 and μ_2 representing Keynesian income and expenditure multipliers. For example, in a model with one sector, one household, and no interindustry flows or imports

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[6]The mathematics of this decomposition is similar to that in Pyatt and Round (1979), except that they used a three-term series expansion. The difference arises from the fact that we define a two-block partition of the multiplier matrix (with two accounts in the first partition) while they used a three-block partition. In both cases, the resulting decomposition matrices have a distinctive structure.

(A = 0 and Y = 1), these expressions are very familiar: $\mu_1 = 1/(1 - MPC)$ and $\mu_2 = MPC/(1 - MPC)$, where MPC is the marginal propensity to consume. In applications with many sectors and households, these multiplier matrices capture complex production-income-consumption linkages.

Now consider the second multiplicative factor matrix, M_2. Its elements measure "open loop" effects, which represent one-directional bilateral transfers between the two blocks of endogenous accounts. For the financial row, the open-loop effect includes net savings generated by income changes. For the real block, the open-loop column measures the induced increment in the demand for investment goods and the corresponding increment to household income. The chain of linkages goes from the column to the row. For example, element (2,3) indicates a chain from investment (Z) through demand for goods (μ_1) to household income (Y).

The third factor matrix, M_3, represent "closed loop" effects. A given closed-loop effect originates with an exogenous injection into one of the endogenous blocks. Part of this injection is then passed on to an account (or agent) in the second block, which in turn passes part of it back to a member of the original block. Consider, for example, element (2,2), γ_1. The injection consists of an exogenous increase in household income (row 2). The causal chain then runs from income to savings (S^H), to investment (Z), to commodity demand (μ_1), and finally back to income (Y). Similarly, consider element (3,3), γ_2. An exogenous increase in savings leads to an increase in investment (Z), which increases commodity demand through the multiplier (μ_1), and hence increases income (Y) and, finally, generates savings (S^H).

The multiplicative decomposition is useful for examining the structure of

the multiplier linkages. It is also useful to define an additive decomposition of the net induced effect of the injection, $(y - x)$, as follows:

$$(12) \quad y - x = (M - I)\, x = [N_3 + N_2 + N_1]\, x$$

where: $N_1 = (M_1 - I)$, $N_2 = (M_2 - I)M_1$, and $N_3 = (M_3 - I)M_2M_1$. The additive decomposition supports analysis of the composition of net effects. Each of the three terms represents a different net component corresponding to one of the three multiplicative factors described above.[7]

3.2 Decomposing Structural Adjustment

The multiplier decompositions described above give a detailed portrait of the net-linkage relationships in the economy. While the impact effects on demand, income, and investment are of considerable interest, it is also important to understand the distributional or compositional implications of exogenous disturbances. To explore these compositional effects, we use measures indicating the deviations from balanced growth in sectoral demand and changes in the distribution of household income. Consider, for example, the multiplier matrix partitioned in such a way that the first row consists of the sectoral demand components. The change in sectoral demand can then be written as:

$$(13) \quad \Delta y^S = M^S \Delta x$$

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[7]This additive decomposition is similar to one proposed by Stone and by Pyatt and Round. See Pyatt and Round (1979). They decompose the total multipliers rather than the net multipliers.

where M^S consists of the first n rows of M, Δ is the difference operator, and Δy^S is the change in sectoral demand arising from the exogenous shock, Δx. The change in sectoral demands, Δy^S, can be additively decomposed into two parts, as shown in Figure 2. The first component is a balanced expansion consisting of a scalar α (measuring the average change) times the initial sectoral demand levels and the second is a change in the composition or structure of demand, given by δy^S.[8]

$$(14) \quad \Delta y^S = \alpha\, y^S + \delta y^S$$

where δ is a "structural change" operator, satisfying $e'\delta y^S = 0$, where e is the summation vector (all ones).

The first component, which gives the expansion (or contraction) factor, can be written:

$$(15) \quad e'(1 + \alpha)y^S = e'(y^S + \Delta y^S)$$

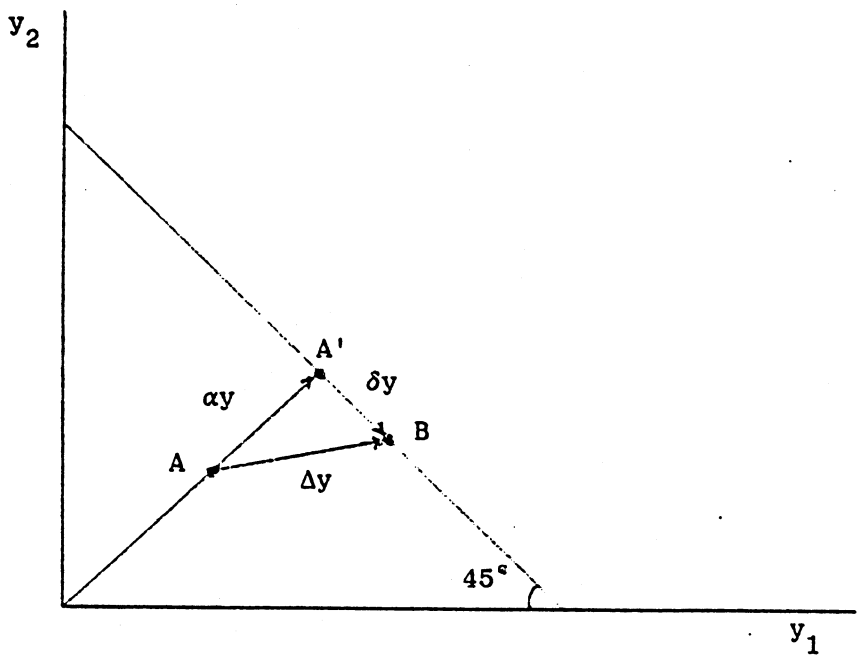
Hence, $\alpha(e'y^S) = e'\Delta y^S$, and α is given by

$$(16) \quad \alpha = (e'y^S)^{-1}(e'\Delta y^S) = (e'y^S)^{-1}(e'M^S\Delta x)$$

The scalar α gives the average or balanced-growth effect of an exogenous shock. The second term, δy^S, measures the structural change in the composition of sectoral demand arising from the shock. This structural-change term

[8]Chenery, Robinson, and Syrquin (1986), chapter 5, use a similar partition between growth and structural change, but use a different decomposition methodology based only on input-output analysis.

Figure 2: Structural Decomposition



can be written as a function of the original multiplier matrix. Substituting equation (16) into (14) yields:

$$(17)\quad \delta y^S = \Delta y^S - (e'y^S)^{-1}(e'\Delta y^S)y^S$$

$$= [I - (e'y^S)^{-1}y^S e']\Delta y^S$$

$$= [M^S - (e'y^S)^{-1}y^S e'M^S]\Delta x$$

$$= \Phi^S \Delta x$$

The matrix Φ^S is termed the "structural adjustment multiplier matrix" since it gives the purely compositional effects on the structure of sectoral demand arising from exogenous shocks. The individual elements (i,j) indicate the compositional impact on the demand for sector i resulting from an exogenous transfer to account (or column) j. A positive sign indicates that sector i will improve its relative position (or share of total demand), and indicates a "beneficial" link. A negative sign indicates a "detrimental" link. If there is a large beneficial link, then sector j has a strong "backward" linkage to sector i, usually because sector i provides intermediate inputs into sector j.[9] Sectors can be defined as "complementary" if there are positive, beneficial links in both directions (i.e., both j to i and i to j). On the other hand, detrimental links in both directions indicate that the sectors are "competitive" in that an increase in demand for sector j leads to a relative

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[9]This definition is consistent with the notion of backward and forward linkages in Hirschman (1958).

decrease in demand for sector i, and vice versa. Mixed signs are also possible, indicating commonality of interest in only one direction. The matrix thus provides an indication of the relative gainers and losers from a particular shock, and of the potential tradeoffs among them.

As noted above, the decomposition into "expansionary" and "structural" effects can be defined for any subset of rows of endogenous accounts in the SAM. For the household accounts, the structural adjustment multiplier matrix, Φ^h, indicates the impact of exogenous injections on the relative distribution of household income. Again, it indicates the relative gainers and losers from any shock. For each block of rows, the matrix indicates the effective distributional relationships among the various actors in the economy.[10] Such structural analysis is very important in any applied policy analysis and is completely outside the scope of aggregate macro models.

4. Application to the U.S. Economy

In this section, we apply the methodology of the previous section to an analysis of structural change for the U.S. economy. The underlying data are based on input-output accounts and the national income and product accounts. The next section describes the generation of SAMs from these data, followed by an analysis of the multipliers for 1982. Finally, we discuss the structural adjustment to macro shocks that occurred in the 1982-85 period.

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[10]See Roland-Holst (1985) who develops this approach in an economywide distribution model. With more detail on the tax and transfer system, the methodology has obvious applications for the analysis of tax and expenditure incidence.

4.1 Social Accounting Matrices for the U. S.

Table 1 presents a SAM for the U.S. for 1982.[11] The SAM is designed to reconcile the input-output and national income and product accounts within a common framework. It captures the circular flow from producers to factors (value added), to categories of income (national income), to "institutions" and, finally, back to commodities (final demand) and producers (activities). The "commodities" account serves as an aggregate department store, buying all domestic production and imports and selling goods to all demanders, both intermediate and final, domestic and foreign.[12]

The rest of the accounts describe the financial flows among institutions, using definitions consistent with those in the national income and product accounts.[13] While useful for many purposes, these accounts are not needed for our macro analysis. To create a SAM similar in structure to the macro SAM in

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[11]The SAM is based on data at the 528 sector level provided by Engineering Economics Associates, Berkeley, California, and reconciles exactly with the published national income and product accounts for 1982. See U.S. Department of Commerce (1984a) for the aggregate accounts. Recent revisions to the macro data have not been taken into account. The input-output table was updated from a 1977 table, which is described in U.S. Department of Commerce (1984b). The approach, known as the RAS method, uses row and column control totals for 1982 and adjusts the input-output coefficients to be consistent with these control totals while remaining as "close" as possible to the 1977 coefficients.

[12]When disaggregated, the two blocks in the upper left-hand corner of the SAM represent the "make" and "use" tables in input-output analysis. They permit sectors to produce more than one commodity and allow different aggregations for activities and commodities.

[13]For example, the "enterprise" account was defined residually in order to reconcile GNP and National Income. The payment from factors to enterprises ($14.1 billion) is "business transfer payments" while the payment from factors to government (-$8.8 billion) is "current surplus less subsidies of government enterprises."

Table 1: Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts:	Cmdts 1	Actvts 2	Fctrs 3	Ind tx 4	Emply 5	Prop 6	Other 7	Entrp 8	Hshld 9	Captl 10	Govt 11	World 12
	Expenditures:											
1 Commodities		2892.4							1984.9	414.9	650.5	348.4
2 Activities	5961.6											
3 Factors (Value Added)		2810.5										
4 Indirect taxes		258.8										
Sum (GNP)		3069.3										
5 Employee compensation			1864.2									
6 Proprietors' income			111.5									
7 Other property income			470.7									
Sum (National Income)			2446.4									
8 Enterprises			14.1				470.7				44.4	
9 Households					1612.9	111.5		439.3			361.9	-1.2
10 Capital Account			358.8					29.2	135.5		-115.2	6.6
11 Government			-8.8	258.8	251.3			60.7	404.1			-24.4
12 Rest of the World	329.4											
Total	6291.0	5961.6	2810.5	258.8	1864.2	111.5	470.7	529.2	2524.5	414.9	941.6	329.4

Table 2: Macro Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts:	Expenditures: Supply 1	Hshlds 2	Cptl 3	Govt 4	World 5	Total 6
1 Suppliers	2892.4	1984.9	414.9	650.5	348.4	6291.0
2 Households	2137.4	.0	.0	388.3	-1.2	2524.5
3 Capital Account	364.8	135.5	.0	-92.0	6.6	414.9
4 Government	567.1	404.1	.0	183.2	-24.4	1129.9
5 Rest of the World	329.4	.0	.0	.0	.0	329.4
6 Total	6291.0	2524.5	414.9	1129.9	329.4	

Figure 1, we "collapsed" accounts 2 to 8, creating a new SAM with 5 blocks of accounts. "Collapsing" is a procedure whereby the transactions of the removed accounts are imputed to the remaining accounts in a way that holds the remaining column and row sums constant.[14] The resulting macro SAM is given in Table 2 and corresponds closely in structure to Figure 1, although it includes a few additional financial flows.[15]

The additional flows in Table 2 include, first, and most significantly, a large government transfer payment to households. Second, there is a payment from suppliers to the government, which represents both indirect and corporate taxes, plus some net transfers. Third, in addition to household saving, there is also direct saving by suppliers, which includes depreciation and corporate saving. Finally, there are intra-government transfers and a payment from the rest of the world to households. These additional financial flows do not change the basic structure of the macro SAM, and the decomposition equations are essentially similar. In the empirical results, these financial flows are taken into account, with additional terms entering the various decomposition equations.

Disaggregated versions of Tables 1 and 2, with twenty sectors and three household categories, are given in the appendix and provide the basis for the

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[14]The procedure is described in Pyatt (1981). Roland-Holst (1987) provides another application of this technique to the U.S., focusing on income distribution.

[15]Note that the government account does not have the same total. The reason is that, in Table 1, transfers between states and the federal government were netted out (179.5 billion) and, in Table 2, the payments by factors to government (-8.2 billion) were treated as a positive expenditure by government to the factor account (1129.9 = 941.6 + 8.2 + 179.5). Note also that the intra-government transfers in Table 2 (183.2 billion) are the net of a variety of transfers between the government and collapsed institutions. Government savings also change, again due to a netting out of transfers among collapsed accounts.

multiplier analysis below. Table 3 presents data on the sectoral composition of various macro aggregates, as well as export and import shares. This information on structural variables facilitates interpretation of the multiplier linkages.

4.2 Multiplier Decomposition

Table 4 presents the total net multiplier matrix (M - I) derived from the disaggregated macro SAM, where the government and rest-of-the-world accounts have been made exogenous. Table 5 presents the ratio of indirect to total net multiplier effects (net of the initial injection) for the additive decomposition, which equals the element-by-element ratio of the sum of the N_2 and N_3 matrices divided by the elements of (M - I).

Consider, for example, column 1 in Table 4. A dollar increase in, say, dairy and meat exports yields a net induced increase in dairy and meat demand of \$0.32 (over and above the direct \$1.00 increase). The total net induced increase in production is \$5.25, of which agriculture gets \$0.83. Total household income increases by \$1.70, which represents the income multiplier from the increase in demand. In general, there is a great deal of sectoral variation in the multipliers. Similarly, there are significant variations in the multipliers for different types of households. However, the aggregate multipliers for gross output and total household income do not vary as much for different shocks. Thus, an increase in spending of a dollar has a similar net indirect effect on aggregate demand or household income, regardless of where the increase is initially spent. The economy exhibits a high degree of

Table 3: Sectoral Composition of Value Added, Output, and Demand: 1982
(percent)

	Sector	Value added	Inter-mediate	Cons	Govt	Invest	Export	Import	Output	Trade shares: E/X	Trade shares: M/(X+M-E)
1	Dairy & meat	.4	2.4	.3	.1	.1	.1	.2	1.3	.3	.9
2	Grains	1.0	1.6	.0	1.0	-.1	5.0	.0	1.2	24.3	.2
3	Other agriculture	.9	1.2	.7	.2	.0	.5	1.4	.8	3.7	9.2
	Sum, agriculture	2.2	5.3	1.0	1.3	-.1	5.6	1.6	3.3	9.9	2.9
4	Mining	4.5	13.5	3.1	1.7	-.5	6.4	22.5	6.9	5.5	16.1
5	Construction	5.1	3.1	.0	12.4	55.1	.0	.0	6.7	.0	.0
6	Food	2.5	4.1	8.7	1.0	-.2	4.1	3.8	5.0	4.8	4.2
7	Textiles	.5	1.6	.4	.1	.1	.7	.9	.9	4.4	5.3
8	Wood & paper	2.8	6.1	1.9	1.9	1.7	2.7	3.3	3.9	4.0	4.6
9	Chemicals	2.5	5.8	1.8	1.3	.0	5.5	4.2	3.7	8.9	6.5
10	Apparel & footwear	.8	.6	3.1	.2	-.2	.5	5.3	1.1	2.7	22.1
11	Metals	1.2	4.2	.0	.1	-.2	1.9	6.2	1.8	6.2	16.6
12	Other industry	1.9	4.5	.3	.6	.7	2.2	2.3	2.4	5.3	5.4
13	Machines	1.6	2.3	.1	.7	10.1	6.7	3.8	2.1	18.5	10.8
14	Electric 1	2.3	2.5	.2	3.1	11.5	6.5	3.1	2.6	14.3	7.1
15	Electric 2	.7	.8	1.1	.6	2.2	2.2	5.1	.8	15.5	29.1
16	Vehicles	1.3	1.8	3.2	2.1	9.1	4.2	10.4	2.5	10.0	20.5
17	Aviation & munitions	.6	.7	.1	4.8	1.2	5.6	1.2	1.2	27.1	7.0
18	Scientific equipment	1.0	1.0	2.0	1.4	-1.1	2.2	4.1	1.1	11.5	18.2
	Sum, industry	29.1	52.6	26.0	32.0	89.7	51.4	76.2	42.7	7.0	9.6
19	Trade & finance	17.3	11.0	22.0	2.7	7.0	5.5	-2.6	13.9	2.3	-1.1
20	Other services	51.4	31.1	51.0	64.0	3.4	37.5	24.8	40.1	5.5	3.5
	Sum, services	68.7	42.1	73.0	66.8	10.4	43.0	22.2	54.0	4.7	2.3
	Total/Average	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	5.8	5.5

Notes:
Cons = consumption,
Govt = government,
Invest = investment,
E/X = exports/production,
M/(X + M - E) = import share of total domestic supply.

Table 4: Net Multipliers, (M - I)

		Dry 1	Grn 2	Oth 3	Mng 4	Cns 5	Fd 6	Txt 7	Wd 8	Chm 9	Apl 10	Mtl 11	Oth 12	Mch 13	El1 14	El2 15	Vhc 16	Avt 17	Sci 18	Trd 19	Oth 20	Low 21	Med 22	Hgh 23	Cpt 24
1	Dairy & meat	.32	.09	.06	.03	.05	.31	.05	.05	.05	.04	.04	.04	.04	.04	.04	.03	.04	.04	.05	.05	.08	.06	.05	.05
2	Grains	.42	.11	.04	.02	.03	.18	.09	.03	.03	.04	.02	.03	.03	.03	.02	.02	.03	.02	.03	.03	.05	.04	.03	.03
3	Other agriculture	.10	.07	.09	.02	.04	.10	.03	.06	.03	.03	.02	.03	.03	.03	.02	.02	.03	.03	.03	.03	.05	.04	.03	.03
	Sum, agriculture	.83	.27	.19	.08	.11	.58	.18	.14	.11	.11	.08	.10	.09	.10	.08	.08	.10	.09	.10	.12	.17	.14	.12	.10
4	Mining	.37	.44	.34	.79	.37	.32	.34	.33	.44	.24	.39	.35	.29	.28	.23	.24	.30	.27	.29	.34	.35	.31	.28	.32
5	Construction	.32	.36	.32	.27	.27	.29	.27	.28	.28	.21	.23	.27	.25	.25	.20	.19	.21	.22	.27	.31	.25	.27	.27	.81
6	Food	.46	.20	.18	.14	.19	.42	.18	.18	.18	.15	.15	.18	.17	.18	.14	.14	.18	.16	.18	.21	.31	.25	.21	.18
7	Textiles	.04	.04	.04	.03	.04	.04	.49	.06	.05	.30	.03	.04	.03	.03	.03	.06	.04	.05	.03	.04	.05	.04	.04	.04
8	Wood & paper	.18	.17	.16	.12	.22	.23	.18	.50	.20	.14	.13	.18	.15	.16	.15	.14	.15	.18	.17	.16	.18	.16	.15	.22
9	Chemicals	.21	.28	.21	.13	.17	.19	.40	.20	.41	.19	.15	.17	.15	.17	.16	.17	.15	.19	.12	.14	.16	.14	.13	.16
10	Apparel & footwear	.05	.05	.05	.04	.05	.05	.06	.05	.05	.23	.04	.05	.05	.05	.04	.04	.05	.05	.05	.05	.08	.07	.07	.05
11	Metals	.09	.09	.08	.07	.15	.09	.08	.09	.09	.06	.35	.30	.24	.16	.13	.21	.19	.13	.07	.08	.07	.07	.07	.16
12	Other industry	.12	.11	.10	.09	.25	.16	.10	.11	.12	.07	.10	.18	.14	.14	.10	.13	.12	.10	.09	.10	.10	.10	.09	.20
13	Machines	.11	.12	.10	.09	.11	.09	.10	.09	.10	.07	.10	.11	.26	.10	.08	.12	.12	.08	.08	.09	.08	.08	.08	.22
14	Electric 1	.10	.11	.10	.08	.13	.09	.09	.09	.09	.07	.08	.09	.12	.26	.14	.10	.23	.10	.09	.10	.08	.09	.09	.25
15	Electric 2	.04	.05	.04	.03	.04	.04	.04	.04	.04	.03	.03	.04	.04	.08	.06	.05	.06	.05	.04	.04	.05	.04	.04	.07
16	Vehicles	.12	.13	.12	.09	.12	.11	.11	.11	.11	.09	.09	.11	.11	.11	.09	.33	.10	.09	.11	.12	.13	.13	.13	.22
17	Aviation & munitions	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.24	.01	.01	.01	.01	.01	.01	.03
18	Scientific equipment	.04	.04	.04	.03	.05	.04	.04	.05	.04	.04	.04	.04	.04	.05	.04	.04	.06	.08	.04	.05	.06	.05	.05	.04
	Sum, industry	2.26	2.20	1.88	2.00	2.18	2.17	2.47	2.20	2.21	1.91	1.91	2.11	2.05	2.05	1.60	1.97	2.18	1.76	1.64	1.83	1.97	1.84	1.73	2.97
19	Trade & finance	.67	.65	.58	.43	.67	.63	.60	.61	.57	.48	.51	.58	.57	.59	.47	.48	.57	.52	.61	.56	.74	.66	.62	.69
20	Other services	1.49	1.53	1.32	1.12	1.47	1.41	1.39	1.45	1.41	1.08	1.19	1.38	1.29	1.35	1.07	1.07	1.44	1.22	1.45	1.42	1.85	1.57	1.45	1.43
	Sum, services	2.16	2.18	1.90	1.55	2.14	2.04	1.99	2.05	1.98	1.56	1.69	1.96	1.87	1.94	1.53	1.55	2.01	1.74	2.07	1.98	2.60	2.23	2.07	2.12
	Sum, all sectors	5.25	4.65	3.97	3.63	4.43	4.79	4.64	4.39	4.29	3.57	3.68	4.18	4.01	4.08	3.22	3.60	4.29	3.59	3.81	3.93	4.74	4.21	3.91	5.20
21	Low 40% households	.19	.20	.18	.14	.19	.18	.18	.18	.18	.15	.15	.18	.17	.18	.14	.14	.17	.16	.18	.19	.18	.15	.14	.18
22	Med 40% households	.71	.72	.69	.53	.77	.69	.71	.73	.69	.58	.60	.71	.69	.73	.57	.57	.73	.65	.74	.74	.68	.60	.56	.73
23	High 20% households	.81	.84	.79	.61	.84	.78	.79	.81	.77	.64	.66	.78	.75	.79	.63	.62	.77	.71	.82	.83	.76	.67	.63	.80
	Sum, households	1.70	1.76	1.66	1.28	1.79	1.64	1.68	1.72	1.64	1.37	1.41	1.66	1.61	1.70	1.34	1.33	1.66	1.52	1.74	1.76	1.62	1.43	1.33	1.71
24	Capital account	.45	.51	.44	.35	.37	.40	.37	.38	.38	.30	.29	.36	.34	.35	.28	.26	.26	.29	.37	.42	.34	.39	.40	.36

Table 5: Own-Effect Shares of Net Multipliers, $(N_1 - I)_{ij}/(M - I)_{ij}$
(percent)

		Dry 1	Grn 2	Oth 3	Mng 4	Cns 5	Fd 6	Txt 7	Wd 8	Chm 9	Apl 10	Mtl 11	Oth 12	Mch 13	El1 14	El2 15	Vhc 16	Avt 17	Sci 18	Trd 19	Oth 20	Low 21	Med 22	Hgh 23	Cpt 24
1	Dairy & meat	95	80	75	65	73	96	76	73	72	75	73	72	73	73	73	74	80	75	73	72	85	79	75	0
2	Grains	98	91	77	66	75	96	92	75	74	84	74	73	74	74	74	77	81	77	74	73	86	80	75	0
3	Other agriculture	89	82	89	63	75	90	73	85	72	76	71	70	70	71	71	73	78	75	71	70	83	76	72	0
	Average, agriculture	96	85	82	65	74	95	84	79	73	78	73	72	72	73	73	75	80	76	73	72	85	79	74	0
4	Mining	71	72	70	89	76	70	73	73	79	70	82	75	72	71	71	74	79	74	69	70	77	70	66	0
5	Construction	17	15	17	23	17	17	18	18	18	16	23	21	18	17	17	19	26	19	16	19	21	15	13	0
6	Food	87	66	68	66	74	87	73	73	73	75	74	73	73	74	74	75	81	76	73	73	86	80	75	0
7	Textiles	62	59	66	58	73	64	98	78	75	97	68	68	68	68	69	85	79	81	66	63	77	71	70	0
8	Wood & paper	60	51	56	54	74	72	66	88	70	66	64	67	63	65	69	71	72	74	66	57	70	63	59	0
9	Chemicals	75	78	75	66	74	74	89	77	89	81	75	75	71	75	79	82	79	82	63	62	75	67	63	0
10	Apparel & footwear	69	65	68	67	75	70	78	74	72	95	75	74	74	75	75	77	82	78	74	71	85	80	79	0
11	Metals	39	34	35	42	71	46	44	52	53	40	90	86	84	75	75	85	84	73	35	35	46	39	36	0
12	Other Industry	44	34	36	42	78	62	44	51	52	41	56	70	63	62	60	71	67	58	37	37	49	40	36	0
13	Machines	35	30	27	38	42	29	36	33	36	29	50	46	79	43	39	65	66	37	21	22	29	23	20	0
14	Electric 1	16	14	15	19	47	17	19	20	20	18	32	27	45	75	63	50	79	47	18	19	26	20	18	0
15	Electric 2	45	43	43	39	55	44	47	47	45	48	51	48	56	79	77	72	76	68	47	46	62	55	50	0
16	Vehicles	39	34	41	37	47	40	43	44	42	44	49	45	51	47	46	87	57	48	44	43	57	53	50	0
17	Aviation & munitions	24	21	26	25	36	26	28	29	29	28	39	36	53	40	36	56	98	36	26	30	38	30	28	0
18	Scientific equipment	72	68	71	71	80	74	77	79	77	82	79	78	79	81	82	82	89	90	78	76	85	81	79	0
	Average, industry	57	49	49	62	63	59	67	62	62	66	66	62	63	62	61	71	74	63	50	49	62	54	50	0
19	Trade & finance	66	60	62	59	72	67	68	68	66	68	70	68	70	70	69	72	77	71	69	62	77	70	67	0
20	Other services	68	65	65	67	73	70	72	72	71	71	74	72	72	73	72	74	81	75	73	68	81	74	71	0
	Average, services	68	63	64	65	73	69	71	71	70	70	73	71	71	72	71	74	80	73	72	66	80	73	70	0
	Average, all sectors	67	58	58	63	68	68	69	67	66	68	69	67	67	67	66	72	77	69	62	59	73	65	61	0
21	Low 40% households	69	66	69	68	74	70	72	73	71	73	74	73	73	74	74	75	79	75	73	71	74	67	63	0
22	Medium 40% households	66	62	66	64	74	68	72	72	70	73	74	72	73	74	73	75	81	76	73	69	73	65	62	0
23	High 20% households	67	64	67	66	74	69	72	72	71	73	74	73	73	74	74	75	80	75	73	70	74	66	63	0
	Average, households	67	63	67	65	74	69	72	72	71	73	74	72	73	74	74	75	80	76	73	70	74	66	62	0
24	Capital account	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

linkage, with many paths through which a shock is disseminated across the system.[16]

Given the choice of macro closure for the model, Table 5 indicates the importance of indirect effects that operate through savings-investment linkages relative to effects that operate through production-income-consumption linkages. Again, there is much variation among sectors and household types, but also significant variation at the macro level. Differences in savings rates appear to be the major cause of these variations. For example, from the disaggregated SAM given in the Appendix, it can be seen that the savings rates for the richer households are higher and they also have higher indirect shares in the total multipliers in their column.

In general, Table 5 indicates that multiplier analysis which ignores the macro linkages that work through the savings-investment mechanism will miss about a third of the multiplier effect of an exogenous increase in demand on both average sectoral demand and household income. In general, the indirect macro linkages are more important for the industrial sectors, and are relatively unimportant for agriculture. Given the macro closure, in which only the capital account is made endogenous, these results probably indicate a lower bound on the importance of such macro linkages.

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[16]These results are consistent with those found by Adelman and Robinson (1986), who used the same data set and specified the same macro closure, but used a different aggregation. See also Henry and Schluter (1985) who explore forward and backward linkages with agriculture, using the 1977 input-output table.

4.3 Structural Adjustment, 1982-1985

By 1982, the major outlines of the new U.S. macro policy were evident. The government deficit was large and growing and the swing in the trade deficit was becoming apparent. There were also shifts in the structure of government spending that had been stated as policy and were being put into effect. An important question for macro economists is, given these shocks, could the agents in the economy correctly predict the consequences for themselves? Assume that, for example, producers had available good macro projections and could accurately estimate the resulting average growth of demand. In effect, assume that they knew the expansion factor α in equation (14). Was that information enough, or did they also need to anticipate the chain of indirect linkages translating a macro shock into structural changes in sectoral demand? How unbalanced was the effect of the shocks? The structural decomposition methodology described earlier can be used to explore these questions.

The Structural Adjustment Multipliers

Table 6 gives the structural adjustment multiplier matrices for both sectors and households, Φ^s and Φ^h, based on the 1982 SAM. A few generalizations stand out. First, the matrix is strongly diagonal. An exogenous increase in sectoral demand helps the affected sector most. Second, the sectors in each column that generally lose most are the two service sectors (19 and 20), which are also the largest sectors (see Table 3). Finally, most sectors are competitive in that both the (i,j) and (j,i) multipliers are negative. There are, however, a number of interesting exceptions.

Table 6: Structural Adjustment Matrix, Φ

	Dry 1	Grn 2	Oth 3	Mng 4	Cns 5	Fd 6	Txt 7	Wd 8	Chm 9	Apl 10	Mtl 11	Oth 12
1 Dairy & meat	1.24	0.02	-0.00	-0.02	-0.02	0.23	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
2 Grains	0.35	1.05	-0.02	-0.03	-0.03	0.11	0.03	-0.03	-0.03	-0.02	-0.03	-0.03
3 Other agriculture	0.05	0.02	1.05	-0.02	-0.01	0.05	-0.01	0.02	-0.01	-0.01	-0.01	-0.01
4 Mining	-0.11	0.01	-0.04	1.43	-0.04	-0.12	-0.10	-0.08	0.03	-0.12	0.03	-0.05
5 Construction	-0.08	0.00	-0.00	-0.02	0.92	-0.08	-0.09	-0.07	-0.06	-0.08	-0.07	-0.06
6 Food	0.15	-0.08	-0.06	-0.09	-0.08	1.14	-0.10	-0.08	-0.08	-0.07	-0.08	-0.08
7 Textiles	-0.02	-0.01	-0.00	-0.02	-0.01	-0.02	1.44	0.01	0.00	0.26	-0.01	-0.01
8 Wood & paper	-0.07	-0.05	-0.03	-0.06	0.01	0.01	-0.04	1.29	-0.00	-0.04	-0.05	-0.02
9 Chemicals	-0.02	0.07	0.03	-0.04	-0.03	-0.02	0.19	0.00	1.22	0.03	-0.03	-0.02
10 Apparel & footwear	-0.03	-0.02	-0.01	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02	1.17	-0.02	-0.02
11 Metals	-0.04	-0.03	-0.02	-0.02	0.04	-0.03	-0.04	-0.02	-0.01	-0.04	1.25	0.19
12 Other industry	-0.03	-0.02	-0.02	-0.02	0.12	0.02	-0.04	-0.01	-0.01	-0.03	-0.01	1.06
13 Machines	-0.03	-0.00	-0.01	-0.01	-0.01	-0.03	-0.03	-0.03	-0.02	-0.03	-0.01	-0.01
14 Electric 1	-0.07	-0.04	-0.04	-0.04	-0.01	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04	-0.05
15 Electric 2	-0.02	-0.01	-0.01	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
16 Vehicles	-0.06	-0.03	-0.02	-0.04	-0.04	-0.06	-0.05	-0.04	-0.04	-0.05	-0.04	-0.04
17 Aviation & munitions	-0.06	-0.06	-0.05	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.05	-0.05	-0.05
18 Scientific equipment	-0.04	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03	-0.02	-0.03	-0.02	-0.02	-0.02
19 Trade & finance	-0.14	-0.09	-0.07	-0.17	-0.04	-0.12	-0.13	-0.09	-0.12	-0.12	-0.11	-0.09
20 Other services	-0.97	-0.69	-0.63	-0.70	-0.66	-0.87	-0.83	-0.67	-0.67	-0.71	-0.65	-0.65
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21 Low 40% households	-0.11	-0.11	-0.11	-0.08	-0.12	-0.11	-0.11	-0.12	-0.11	-0.09	-0.10	-0.11
22 Medium 40% households	0.02	0.01	0.02	0.01	0.04	0.03	0.04	0.04	0.03	0.03	0.03	0.04
23 High 20% households	0.09	0.10	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.06	0.06	0.08
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6: Structural Adjustment Matrix, Φ (cont.)

									Households:			
	Mch	El1	El2	Vhc	Avt	Sci	Trd	Oth	Low	Med	Hgh	Cpt
	13	14	15	16	17	18	19	20	21	22	23	24
1 Dairy & meat	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	0.02	0.01	0.00	-0.02
2 Grains	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.01	-0.01	-0.01	-0.03
3 Other agriculture	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	0.00	0.00	-0.01
4 Mining	-0.10	-0.11	-0.09	-0.11	-0.11	-0.08	-0.08	-0.04	-0.01	-0.01	-0.02	-0.07
5 Construction	-0.07	-0.07	-0.07	-0.10	-0.13	-0.08	-0.04	-0.00	-0.05	0.00	0.02	0.48
6 Food	-0.08	-0.07	-0.07	-0.09	-0.08	-0.07	-0.05	-0.04	0.08	0.05	0.02	-0.08
7 Textiles	-0.01	-0.01	-0.01	0.01	-0.01	0.01	-0.01	-0.01	0.00	0.00	0.01	-0.00
8 Wood & paper	-0.05	-0.04	-0.02	-0.04	-0.06	0.01	-0.01	-0.03	-0.00	0.00	0.00	0.02
9 Chemicals	-0.04	-0.01	0.01	0.00	-0.05	0.02	-0.06	-0.04	-0.01	-0.01	-0.01	-0.03
0 Apparel & footwear	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	0.02	0.02	0.02	-0.02
1 Metals	0.14	0.06	0.05	0.11	0.08	0.03	-0.03	-0.02	-0.02	-0.01	-0.01	0.05
2 Other industry	0.02	0.02	0.00	0.02	-0.01	-0.00	-0.03	-0.02	-0.02	-0.00	-0.00	0.08
3 Machines	1.15	-0.01	-0.02	0.02	0.01	-0.03	-0.03	-0.02	-0.03	-0.01	-0.01	0.11
4 Electric 1	-0.02	1.12	0.03	-0.03	0.09	-0.02	-0.04	-0.03	-0.04	-0.02	-0.01	0.11
5 Electric 2	-0.01	0.03	1.02	0.00	0.00	-0.00	-0.01	-0.01	-0.00	-0.00	0.00	0.02
6 Vehicles	-0.03	-0.04	-0.04	1.19	-0.05	-0.04	-0.03	-0.02	-0.01	0.01	0.02	0.07
7 Aviation & munitions	-0.05	-0.05	-0.04	-0.04	1.18	-0.05	-0.05	-0.05	-0.05	-0.04	-0.04	-0.04
8 Scientific equipment	-0.02	-0.02	-0.01	-0.02	-0.01	1.02	-0.02	-0.02	-0.00	-0.00	-0.00	-0.03
9 Trade & finance	-0.08	-0.07	-0.08	-0.12	-0.12	-0.08	0.99	-0.08	0.13	0.11	0.11	0.01
0 Other services	-0.68	-0.65	-0.59	-0.74	-0.64	-0.59	-0.43	0.48	-0.01	-0.09	-0.09	-0.61
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1 Low 40% households	-0.11	-0.12	-0.09	-0.09	-0.12	-0.11	-0.12	-0.12	0.72	-0.27	-0.26	-0.12
2 Medium 40% households	0.04	0.04	0.03	0.04	0.06	0.04	0.04	0.03	-0.37	0.63	-0.38	0.04
3 High 20% households	0.07	0.07	0.06	0.06	0.06	0.06	0.08	0.08	-0.35	-0.36	0.64	0.08
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

For example, consider the agricultural sectors. Sectors 1 and 2 (dairy & meat and grains) are complementary, with an especially large beneficial backward linkage from dairy to grains. Similarly, sectors 1 and 6 (dairy & meat and processed food) are also complementary, with large beneficial links in both directions. There are also significant mixed links between processed food and sectors 2 and 3 (grains and other agriculture), with beneficial backward linkages from processed food, but competitive links from the other sectors to processed food.

Most of the other exceptions involve strong beneficial backward linkages, with negative links in the other direction. For example, construction provides beneficial links with metals and other industry (sectors 11 and 12). Similarly, there are beneficial links between a number of sectors and the major intermediate supplying sectors (chemicals, metals, and other industry). In general, these results indicate the importance of linkages through the demand for intermediate inputs.

The structural adjustment multiplier matrix for households, Φ^h, is given at the bottom of Table 6. It indicates that, in general the upper 60 percent of households gain at the expense of the bottom 40 percent. Only exogenous direct transfers to the bottom 40 percent yield a net gain in their relative position (see column 21, rows 21-23). The reason for this result is that a large share of the income of the poorest 40 percent comes from government transfer payments, which are exogenous and hence fixed nominally in this model.[17] In this case, macroeconomic linkages determine complementarity or competitiveness.

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[17]See the SAM in Table 1 and Appendix Table 1. These transfers include all government pensions as well as social security, unemployment benefits, and various welfare programs.

Macroeconomic Shocks, 1983-1985

Although the Φ matrices characterize potential interactions between endogenous agents, actual effects depend on the composition of the exogenous shock. To examine actual net interaction effects, we consider the changes in government expenditures and exports that occurred in the period 1983-85. These changes are computed in nominal terms, so the results indicate changes in nominal demand in this period arising from the observed changes in nominal government expenditure and exports.[18] Given the assumption of a fixed multiplier matrix, the model neglects any supply constraints, substitution possibilities, or changes in coefficients. It is thus not a forecasting tool, but is designed only to capture the demand impact of shifts in exogenous expenditures.

The results are summarized in Figures 3 to 6. Figure 3 indicates, for each sector and year, the ratio (in percent) of the contribution of demand arising from structural adjustment (dz) to the absolute change arising from balanced growth (αy, where α is the same for all sectors). The values of α for the three years, which represent the average aggregate growth rates of demand arising from the multipliers, are: -2.3, 4.6, and 7.8 percent. In the first year, 1982-83, α was negative. In the figures, the absolute value of the change (αy) is used so that a positive contribution of structural adjustment to demand always indicates an increase in demand. Figures 4 and 5 indi-

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[18]Inflation was relatively low during this period, so the differences between real and nominal changes are not great, although there are significant sectoral variations.. A further decomposition into real and price effects would also be feasible.

Figure 3: Structural Adjustment Shares (Percent), Total

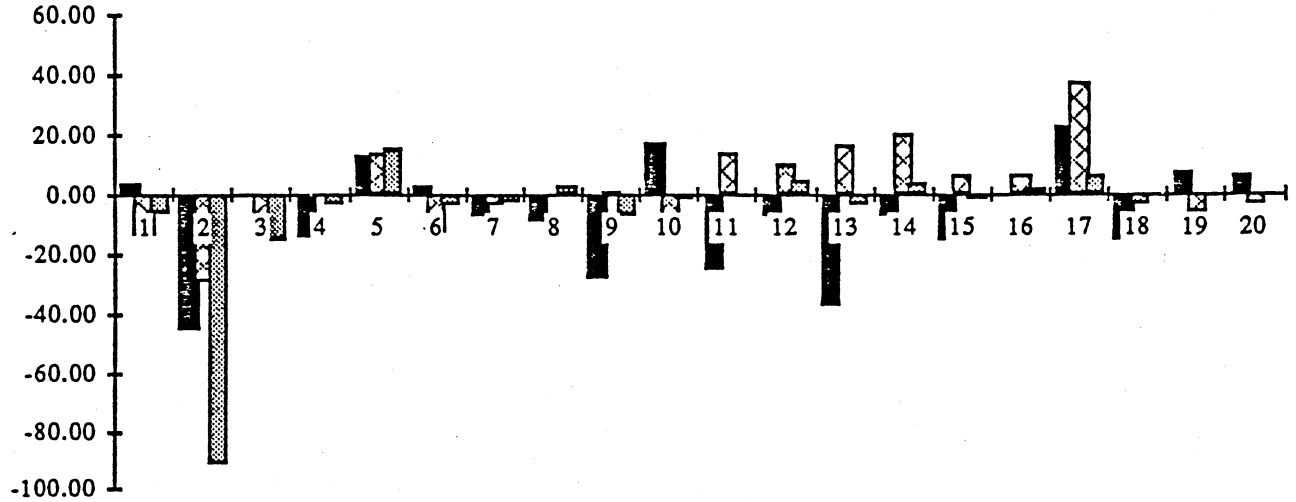


Figure 4: Structural Adjustment Shares (Percent), Government

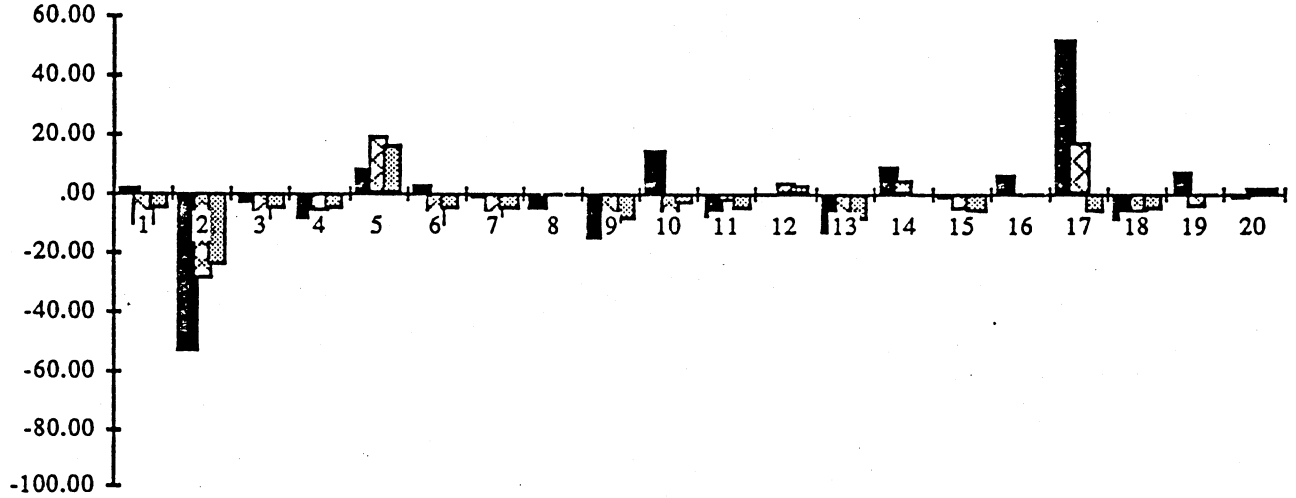


Figure 5: Structural Adjustment Shares (Percent), Trade

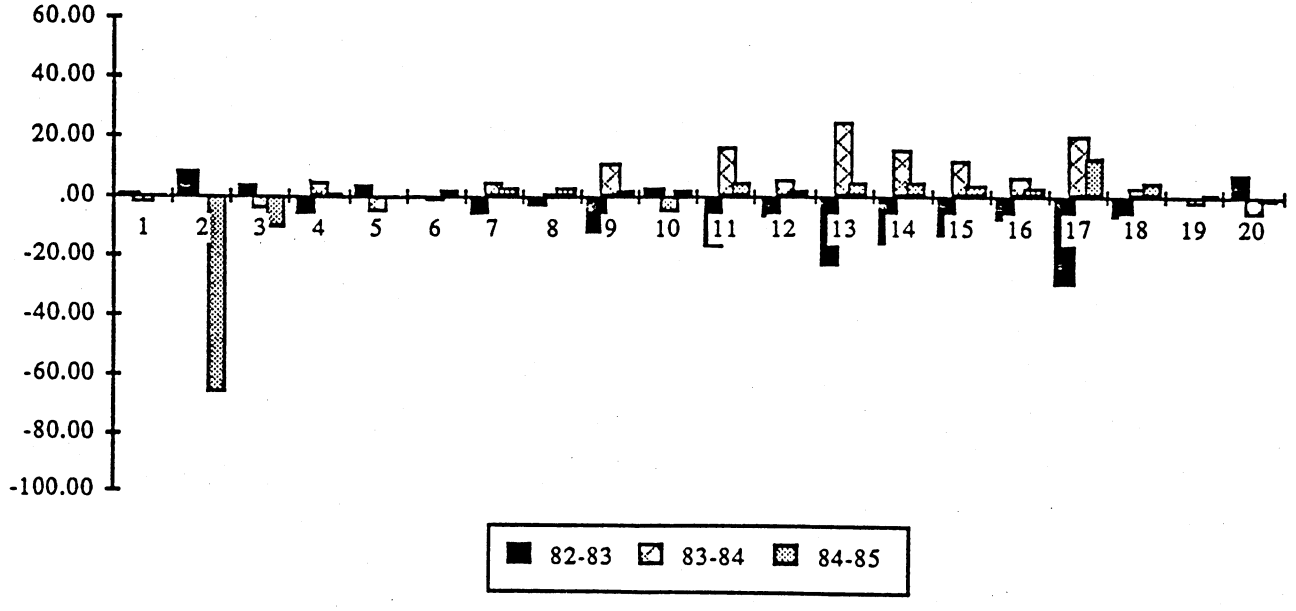
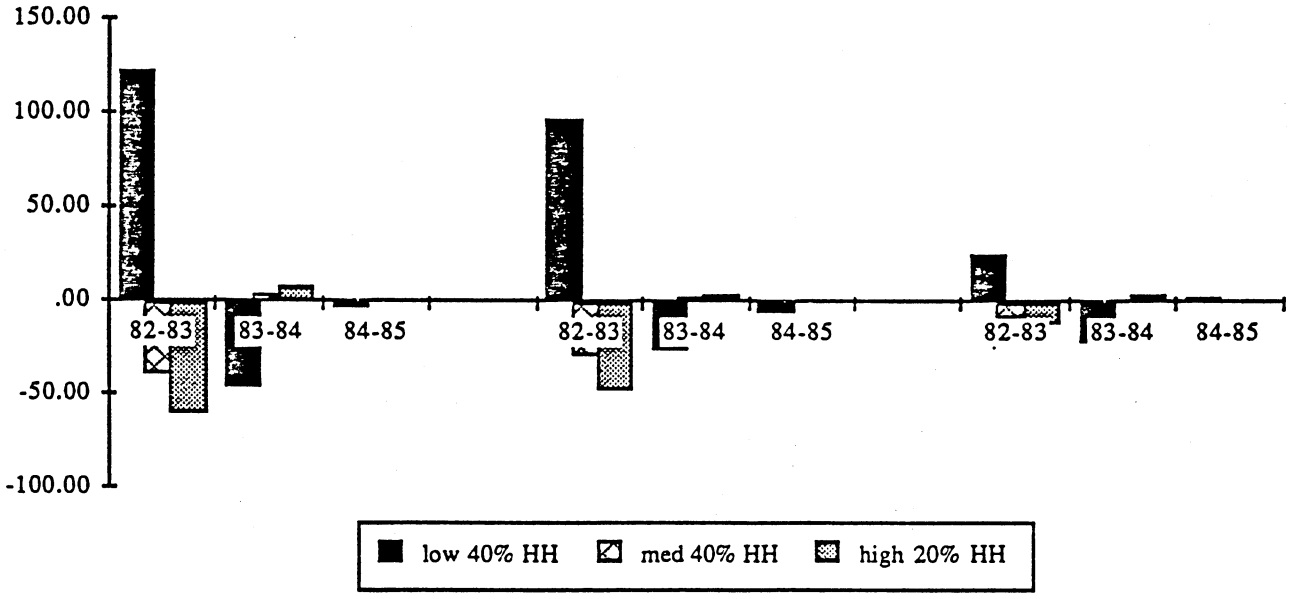


Figure 6: Structural Adjustment Shares (Percent), Household Income



cate the separate contributions of structural adjustment arising from changes in government expenditure and exports, with the sum of the contributions equaling those in Figure 3.

There are a number of sectors in which the ratio of changes in demand arising from structural adjustment to that arising from balanced growth exceeds plus or minus 15 percent in one or more years. Gainers include: construction (all years), apparel, machinery, electric 1, and aviation & munitions. Losers include: the agricultural sectors (sectors 1-3), mining, chemicals, apparel, metals, machines, electric 2, and scientific equipment. The most dramatic effects are in grains, chemicals, metals, machinery, and aviation & munitions.

From Figure 5, the export effect was negative in the industrial sectors in 1982-83, with a swing to positive in 1983-84, and then a decline to insignificance in 1984-85. In the agricultural sectors, the export effect was small in 1982-84, but very large and negative for grains in 1984-85. The decline in grain exports contributed the most to the large decline in demand for grains arising from structural adjustment, with the total almost completely offsetting the growth effect so that grains did not gain from the general recovery in 1984-85. On the other hand, aviation & munitions gained from structural adjustment in every year, with a very large government contribution more than offsetting a negative export effect in 1982-83.

Figure 6 indicates the impact of structural adjustment on household income for the three groups. In this figure, the shares are of the change in total household income. The average growth rates in household income arising from the exogenous shocks, or α's, are: -0.2, 4.6, and 7.6 percent for 1982-83, 1983-84, and 1984-85. Figure 6 indicates that structural change is very

important in the first two years, and is insignificant in 1984-85. In 1982-83, when there was only a small negative average change, structural adjustments arising from changes in government transfers were very important. In 1982-83, the impact of changes in transfers to the lowest 40 percent of households more than offset the negative aggregate effect of the macro shock, and their incomes rose while the other two groups experienced a fall in income.[19] In 1983-84, changes in government transfers had a negative impact on the lowest 40 percent of households, as did trade adjustments. The two effects together caused the change in income of the poorest 40 percent to lag significantly behind the general rise in household income. The compositional effects were more important in the first two periods in which aggregate growth was small in absolute terms.

In general, the results indicate the importance of structural adjustment during this period. Knowledge of only the average impact of a macro shock on growth in demand or household income would have been very misleading for many economic actors. A more complex model of the economy is required during a period of structural shifts if economic agents are to be able to anticipate the impact of macro shocks on their income. The sorts of reduced-form, aggregate macro models used in recent empirical work, which emphasize the role of expectations, are quite unlikely to be adequate descriptions of an economy undergoing structural adjustment.

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[19]The increase in transfers was probably related to increased payments to the unemployed and served as an automatic stabilizer on household income of the poorest group.

5. Conclusion and Extensions

The SAM-multiplier model can be used to support analysis of important structural linkages in the economy. The model is able to delineate the changes in sectoral demand, household incomes, expenditure, and investment resulting from a macro shock. While the example given here is highly aggregated, actual analysis can be done using input-output tables for the U.S. with over 500 sectors. The focus of the analysis is on capturing the myriad of indirect as well as direct linkages by which macro changes affect the economy. These linkages are crucial in determining the structural impact of shocks such as those the U.S. economy has experienced in recent years.

While the behavioral specification used in the SAM-based multiplier model emphasizes important linkages, it is too simplistic for much policy analysis. The model is demand driven and completely ignores issues of price adjustments, resource allocation, productivity, and factor utilization. With its fixed coefficients, the model ignores substitution possibilities in consumption, production, imports, and exports. The model does not capture supply-demand interactions of agents operating across markets in response to shifts in market signals.

In recent years, computable general equilibrium (CGE) models have been developed and widely applied in developing countries to examine the sorts of issues raised in this paper.[20] A CGE model is nonlinear and operates by simulating the behavior of agents across markets. Its solution generates relative

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[20]See Dervis, de Melo, and Robinson (1982) and Robinson (1986) for surveys of the use of CGE models in developing countries. Existing CGE models of the U.S. have focused on either tax policy or energy. For a survey, see Shoven and Whalley (1984).

prices as well as production, employment, and income levels. In essence, a CGE model starts from the institutional description of the economy provided by the SAM and adds a great deal more behavioral structure. To the SAM multiplier model, a CGE model adds the supply side and market mechanisms for reconciling supply and demand. The institutional structures of the model economies, however, are the same.

CGE models are based on SAMs in much the same way that macro models are based on the national income and product accounts. The SAM provides a framework that emphasizes structural relationships and complex, indirect linkages among economic actors. The multiplier analysis of the U.S. economy in the 1980s indicates the limitations of macro analysis in a period characterized by structural changes. To predict and hence anticipate the results of macroeconomic shocks in this period would have required more than an aggregated macro model. Multisectoral models better represent the complex transmission mechanisms by which external and/or policy shocks lead to sectoral as well as macroeconomic imbalances.

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Appendix: Social Accounting Matrices for the U.S.

Table A1: Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts	Expenditures: Dairy 1	Grains 2	Other 3	Mining 4	Const 5	Food 6	Txtls 7	Wood 8	Chem 9	Apprl 10	Metals 11
1 Dairy & meat	12.95	2.14	0.57	0.00	0.00	53.08	0.20	0.12	0.06	0.02	0.00
2 Grains	21.55	4.93	0.25	0.00	0.00	17.21	2.35	0.01	0.08	0.02	0.00
3 Other agriculture	2.41	2.18	2.95	0.02	1.48	12.97	0.00	5.19	0.46	0.30	0.01
4 Mining	1.21	5.59	2.35	176.93	18.99	2.62	0.80	5.91	20.50	0.48	10.46
5 Construction	0.60	0.93	1.05	10.73	0.59	1.70	0.32	1.82	1.80	0.25	1.83
6 Food	14.20	0.04	0.17	0.11	0.05	49.74	0.02	0.45	1.76	0.55	0.06
7 Textiles	0.02	0.11	0.20	0.07	1.90	0.10	17.83	2.52	1.88	12.96	0.10
8 Wood & paper	0.14	0.05	0.53	2.06	20.83	15.17	0.76	63.55	8.70	0.93	0.93
9 Chemicals	1.03	7.48	3.34	7.59	10.05	6.40	8.25	10.55	51.20	2.43	3.35
10 Apparel & footwear	0.05	0.00	0.01	0.08	0.09	0.04	0.36	0.21	0.06	13.04	0.03
11 Metals	0.01	0.05	0.03	1.36	13.09	0.16	0.06	2.13	2.40	0.01	28.33
12 Other industry	0.16	0.18	0.16	2.68	56.83	14.25	0.17	3.76	4.30	0.13	2.05
13 Machines	0.67	0.94	0.40	5.68	6.44	0.53	0.44	1.81	2.48	0.18	2.64
14 Electric 1	0.02	0.02	0.02	0.95	14.58	0.11	0.04	0.30	0.32	0.02	0.94
15 Electric 2	0.10	0.32	0.10	0.10	1.59	0.03	0.02	0.13	0.13	0.05	0.16
16 Vehicles	0.06	0.05	0.31	0.29	0.68	0.03	0.02	0.21	0.09	0.02	0.47
17 Aviation & munitions	0.01	0.01	0.02	0.06	0.34	0.02	0.01	0.05	0.07	0.00	0.11
18 Scientific equipment	0.01	0.02	0.03	0.43	2.12	0.32	0.07	1.38	0.75	0.78	0.26
19 Trade & finance	5.10	4.77	2.87	9.29	41.60	19.44	2.80	14.17	10.46	3.21	7.18
20 Other services	5.96	12.17	4.94	51.85	52.41	28.21	4.70	32.90	34.12	4.80	14.50
Sum	66.25	41.97	20.28	270.28	243.65	222.14	39.22	147.16	141.62	40.18	73.38
21 Labor	4.68	3.25	10.86	33.43	134.13	38.71	11.53	62.20	48.51	18.16	30.02
22 Capital	5.02	25.46	14.65	80.48	17.80	26.69	3.14	19.52	23.92	5.17	3.44
23 Indirect taxes	1.37	1.28	1.00	24.87	4.20	10.12	0.47	2.74	3.60	0.29	2.04
Sum	11.06	29.99	26.51	138.78	156.12	75.52	15.14	84.45	76.03	23.62	35.50
24 Employee compensation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25 Propietors income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 Other property income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27 Low 40% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28 Medium 40% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29 HIgh 20% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30 Capital account	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31 Government	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32 Rest of the world	0.67	0.12	4.57	74.12	0.00	12.38	2.89	10.78	13.82	17.60	20.33
Total	77.98	72.08	51.36	483.18	399.77	310.03	57.25	242.40	231.47	81.39	129.21

Table A1: Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts	Other 12	Mchnes 13	Elctrc1 14	Elctrc2 15	Vhcls 16	Aviat 17	Scient 18	Trade 19	Other 20	Sum	Labor 21
1 Dairy & meat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	1.56	70.77	0.00
2 Grains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.95	47.43	0.00
3 Other agriculture	0.02	0.00	0.00	0.00	0.01	0.00	0.04	0.83	6.47	35.34	0.00
4 Mining	5.42	1.36	1.09	0.38	0.88	0.82	1.16	12.55	121.29	390.79	0.00
5 Construction	2.17	0.93	0.84	0.22	0.61	0.57	0.36	5.08	58.58	90.98	0.00
6 Food	0.07	0.03	0.04	0.02	0.02	0.01	0.13	0.59	49.27	117.32	0.00
7 Textiles	0.21	0.14	0.06	0.06	2.92	0.24	0.99	0.28	2.42	45.02	0.00
8 Wood & paper	3.55	1.19	2.09	1.58	2.90	0.46	3.38	22.16	25.05	176.02	0.00
9 Chemicals	5.25	2.27	5.58	3.02	7.24	0.90	4.87	1.87	25.47	168.15	0.00
10 Apparel & footwear	0.06	0.04	0.07	0.01	0.09	0.04	0.19	0.28	2.38	17.11	0.00
11 Metals	23.82	14.85	8.99	3.23	14.90	4.75	3.45	0.07	0.79	122.49	0.00
12 Other industry	11.91	5.32	6.59	1.87	7.79	1.72	1.95	0.82	6.86	129.51	0.00
13 Machines	3.07	21.74	2.62	0.65	7.14	2.92	0.57	0.60	5.71	67.24	0.00
14 Electric 1	0.80	3.45	24.87	4.09	3.83	8.58	2.17	0.87	7.20	73.15	0.00
15 Electric 2	0.12	0.58	6.88	2.00	2.88	1.01	1.19	0.43	5.42	23.25	0.00
16 Vehicles	0.30	1.15	0.24	0.08	35.72	0.23	0.06	0.47	12.89	53.36	0.00
17 Aviation & munitions	0.13	0.48	0.22	0.04	0.48	14.44	0.04	0.03	2.31	18.87	0.00
18 Scientific equipment	0.42	0.43	0.98	0.57	0.80	1.21	3.43	2.50	12.70	29.21	0.00
19 Trade & finance	8.33	8.70	9.96	3.22	8.96	3.50	4.18	74.93	75.42	318.07	0.00
20 Other services	19.66	12.95	16.89	5.31	10.22	13.27	8.76	172.77	391.95	898.35	0.00
Sum	85.32	75.62	88.01	26.37	107.37	54.66	36.93	297.28	814.69	2892.39	0.00
21 Labor	41.48	38.41	57.74	17.65	37.05	28.18	30.02	350.91	867.32	1864.22	0.00
22 Capital	13.66	10.62	10.88	4.20	0.79	-11.19	0.73	94.01	597.27	946.27	0.00
23 Indirect taxes	1.84	1.33	1.31	0.53	2.55	0.58	0.65	86.53	111.49	258.76	0.00
Sum	56.98	50.35	69.93	22.38	40.39	17.57	31.40	531.45	1576.08	3069.25	0.00
24 Employee compensation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1612.91
25 Propietors income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 Other property income	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1612.91
27 Low 40% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28 Medium 40% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29 HIgh 20% households	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30 Capital account	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31 Government	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	251.31
32 Rest of the world	7.72	12.48	10.30	16.91	34.25	3.96	13.46	-8.72	81.77	329.40	0.00
Total	150.02	138.44	168.24	65.67	182.01	76.19	81.79	820.01	2472.55	6291.04	1864.22

Table A1: Social Accounting Matrix for the U.S., 1982
(billion dollars)

	Receipts	Cptl 22	Ind tx 23	Sum	Emp cmp 24	Prop 25	Other 26	Sum	Low 27	Medium 28	HIgh 29	Sum
1	Dairy & meat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	2.69	1.80	6.27
2	Grains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.36	0.36	0.86
3	Other agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	5.39	4.56	13.28
4	Mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.94	27.66	20.29	60.89
5	Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Food	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.11	75.42	52.20	172.72
7	Textiles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49	3.39	3.69	8.56
8	Wood & paper	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.55	15.25	14.63	37.43
9	Chemicals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.74	14.74	12.16	35.64
10	Apparel & footwear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.25	24.01	25.78	62.05
11	Metals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.03
12	Other industry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	2.42	2.55	6.17
13	Machines	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.49	0.49	1.23
14	Electric 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97	1.90	1.92	4.78
15	Electric 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.57	9.16	8.15	21.88
16	Vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.44	26.25	28.03	62.72
17	Aviation & munitions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.58	0.60	1.49
18	Scientific equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.95	17.08	15.87	39.89
19	Trade & finance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.18	175.28	171.35	435.81
20	Other services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	233.53	400.55	379.12	1013.19
	Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	438.72	802.62	743.55	1984.89
21	Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Capital	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Indirect taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	Employee compensation	0.00	0.00	1612.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Propietors income	111.50	0.00	111.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	Other property income	834.77	0.00	834.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Sum	946.27	0.00	2559.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Low 40% households	0.00	0.00	0.00	145.40	9.72	80.61	235.73	0.00	0.00	0.00	0.00
28	Medium 40% households	0.00	0.00	0.00	742.07	33.92	133.37	909.36	0.00	0.00	0.00	0.00
29	HIgh 20% households	0.00	0.00	0.00	725.44	67.87	225.32	1018.63	0.00	0.00	0.00	0.00
	Sum	0.00	0.00	0.00	1612.91	111.50	439.30	2163.72	0.00	0.00	0.00	0.00
30	Capital account	0.00	0.00	0.00	0.00	0.00	388.05	388.05	-18.76	56.86	97.40	135.50
31	Government	0.00	258.76	510.07	0.00	0.00	60.66	60.66	20.71	156.47	226.90	404.08
32	Rest of the world	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	946.27	258.76	3069.25	1612.91	111.50	888.01	2612.43	440.67	1015.95	1067.86	2524.47

Table A1: Social Accounting Matrix for the U.S., 1982
(billion dollars)

	Receipts	Cptl 30	Govt 31	World 32	Total
1	Dairy & meat	0.37	0.37	0.20	77.98
2	Grains	-0.43	6.76	17.46	72.08
3	Other agriculture	-0.16	1.15	1.75	51.36
4	Mining	-1.97	11.13	22.34	483.18
5	Construction	228.41	80.35	0.04	399.77
6	Food	-0.73	6.52	14.21	310.03
7	Textiles	0.55	0.72	2.40	57.25
8	Wood & paper	7.10	12.56	9.30	242.40
9	Chemicals	-0.16	8.51	19.32	231.47
10	Apparel & footwear	-0.91	1.44	1.70	81.39
11	Metals	-0.65	0.61	6.73	129.21
12	Other industry	3.10	3.68	7.56	150.02
13	Machines	41.96	4.72	23.30	138.44
14	Electric 1	47.61	20.19	22.51	168.24
15	Electric 2	9.16	3.83	7.55	65.67
16	Vehicles	37.78	13.35	14.80	182.01
17	Aviation & munitions	5.16	31.07	19.60	76.19
18	Scientific equipment	-4.47	9.32	7.84	81.79
19	Trade & finance	29.14	17.72	19.27	820.01
20	Other services	13.98	416.50	130.53	2472.55
	Sum	414.86	650.47	348.43	6291.04
21	Labor	0.00	0.00	0.00	1864.22
22	Capital	0.00	0.00	0.00	946.27
23	Indirect taxes	0.00	0.00	0.00	258.76
	Sum	0.00	0.00	0.00	3069.25
24	Employee compensation	0.00	0.00	0.00	1612.91
25	Propietors income	0.00	0.00	0.00	111.50
26	Other property income	0.00	53.25	0.00	888.01
	Sum	0.00	53.25	0.00	2612.43
27	Low 40% households	0.00	205.12	-0.18	440.67
28	Medium 40% households	0.00	107.09	-0.51	1015.95
29	HIgh 20% households	0.00	49.71	-0.48	1067.86
	Sum	0.00	361.92	-1.16	2524.47
30	Capital account	0.00	-115.24	6.55	414.86
31	Government	0.00	179.51	-24.42	1129.91
32	Rest of the world	0.00	0.00	0.00	329.40
	Total	414.86	1129.91	329.40	

Table A2: Macroeconomic Social Accounting Matrix for the U.S., 1982
(billion dollars)

	Expenditures:									
	Dairy	Grains	Other	Mining	Const	Food	Txtls	Wood	Chem	Apprl
Receipts	1	2	3	4	5	6	7	8	9	10
1 Dairy & meat	12.95	2.14	0.57	0.00	0.00	53.08	0.20	0.12	0.06	0.02
2 Grains	21.55	4.93	0.25	0.00	0.00	17.21	2.35	0.01	0.08	0.02
3 Other agriculture	2.41	2.18	2.95	0.02	1.48	12.97	0.00	5.19	0.46	0.30
4 Mining	1.21	5.59	2.35	176.93	18.99	2.62	0.80	5.91	20.50	0.48
5 Construction	0.60	0.93	1.05	10.73	0.59	1.70	0.32	1.82	1.80	0.25
6 Food	14.20	0.04	0.17	0.11	0.05	49.74	0.02	0.45	1.76	0.55
7 Textiles	0.02	0.11	0.20	0.07	1.90	0.10	17.83	2.52	1.88	12.96
8 Wood & paper	0.14	0.05	0.53	2.06	20.83	15.17	0.76	63.55	8.70	0.93
9 Chemicals	1.03	7.48	3.34	7.59	10.05	6.40	8.25	10.55	51.20	2.43
10 Apparel & footwear	0.05	0.00	0.01	0.08	0.09	0.04	0.36	0.21	0.06	13.04
11 Metals	0.01	0.05	0.03	1.36	13.09	0.16	0.06	2.13	2.40	0.01
12 Other industry	0.16	0.18	0.16	2.68	56.83	14.25	0.17	3.76	4.30	0.13
13 Machines	0.67	0.94	0.40	5.68	6.44	0.53	0.44	1.81	2.48	0.18
14 Electric 1	0.02	0.02	0.02	0.95	14.58	0.11	0.04	0.30	0.32	0.02
15 Electric 2	0.10	0.32	0.10	0.10	1.59	0.03	0.02	0.13	0.13	0.05
16 Vehicles	0.06	0.05	0.31	0.29	0.68	0.03	0.02	0.21	0.09	0.02
17 Aviat & munitions	0.01	0.01	0.02	0.06	0.34	0.02	0.01	0.05	0.07	0.00
18 Scientific equipment	0.01	0.02	0.03	0.43	2.12	0.32	0.07	1.38	0.75	0.78
19 Trade & finance	5.10	4.77	2.87	9.29	41.60	19.44	2.80	14.17	10.46	3.21
20 Other services	5.96	12.17	4.94	51.85	52.41	28.21	4.70	32.90	34.12	4.80
Sum	66.25	41.97	20.28	270.28	243.65	222.14	39.22	147.16	141.62	40.18
21 Low 40% households	0.82	2.55	2.17	9.88	12.07	5.43	1.18	6.61	5.94	1.88
22 Medium 40 % households	2.71	5.58	6.79	26.86	56.39	19.90	5.12	28.04	23.34	8.10
23 High 20% households	3.30	8.79	8.56	36.80	57.45	22.95	5.41	29.97	25.95	8.60
Sum	6.83	16.92	17.52	73.53	125.91	48.28	11.71	64.63	55.23	18.58
24 Capital account	1.93	9.82	5.65	31.02	6.86	10.29	1.21	7.52	9.22	1.99
25 Government	2.30	3.25	3.34	34.23	23.35	16.94	2.21	12.30	11.58	3.04
26 Rest of the world	0.67	0.12	4.57	74.12	0.00	12.38	2.89	10.78	13.82	17.60
Total	77.98	72.08	51.36	483.18	399.77	310.03	57.25	242.40	231.47	81.39

Table A2: Macroeconomic Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts	Metals 11	Other 12	Mchnes 13	Elctrc1 14	Elctrc2 15	Vhcls 16	Aviat 17	Scient 18	Trade 19	Other 20
1 Dairy & meat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	1.56
2 Grains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.95
3 Other agriculture	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.04	0.83	6.47
4 Mining	10.46	5.42	1.36	1.09	0.38	0.88	0.82	1.16	12.55	121.29
5 Construction	1.83	2.17	0.93	0.84	0.22	0.61	0.57	0.36	5.08	58.58
6 Food	0.06	0.07	0.03	0.04	0.02	0.02	0.01	0.13	0.59	49.27
7 Textiles	0.10	0.21	0.14	0.06	0.06	2.92	0.24	0.99	0.28	2.42
8 Wood & paper	0.93	3.55	1.19	2.09	1.58	2.90	0.46	3.38	22.16	25.05
9 Chemicals	3.35	5.25	2.27	5.58	3.02	7.24	0.90	4.87	1.87	25.47
10 Apparel & footwear	0.03	0.06	0.04	0.07	0.01	0.09	0.04	0.19	0.28	2.38
11 Metals	28.33	23.82	14.85	8.99	3.23	14.90	4.75	3.45	0.07	0.79
12 Other industry	2.05	11.91	5.32	6.59	1.87	7.79	1.72	1.95	0.82	6.86
13 Machines	2.64	3.07	21.74	2.62	0.65	7.14	2.92	0.57	0.60	5.71
14 Electric 1	0.94	0.80	3.45	24.87	4.09	3.83	8.58	2.17	0.87	7.20
15 Electric 2	0.16	0.12	0.58	6.88	2.00	2.88	1.01	1.19	0.43	5.42
16 Vehicles	0.47	0.30	1.15	0.24	0.08	35.72	0.23	0.06	0.47	12.89
17 Aviat & munitions	0.11	0.13	0.48	0.22	0.04	0.48	14.44	0.04	0.03	2.31
18 Scientific equipment	0.26	0.42	0.43	0.98	0.57	0.80	1.21	3.43	2.50	12.70
19 Trade & finance	7.18	8.33	8.70	9.96	3.22	8.96	3.50	4.18	74.93	75.42
20 Other services	14.50	19.66	12.95	16.89	5.31	10.22	13.27	8.76	172.77	391.95
Sum	73.38	85.32	75.62	88.01	26.37	107.37	54.66	36.93	297.28	814.69
21 Low 40% households	2.65	4.47	3.96	5.49	1.76	2.96	1.19	2.41	35.86	121.61
22 Medium 40 % households	12.53	18.81	17.08	24.81	7.73	14.88	9.33	12.07	155.51	445.79
23 High 20% households	12.70	20.18	18.08	25.68	8.11	14.65	7.66	11.90	164.34	514.04
Sum	27.88	43.46	39.11	55.98	17.60	32.50	18.18	26.37	355.71	1081.44
24 Capital account	1.33	5.27	4.09	4.20	1.62	0.31	-4.31	0.28	36.24	230.24
25 Government	6.29	8.26	7.14	9.75	3.17	7.59	3.70	4.74	139.50	264.40
26 Rest of the world	20.33	7.72	12.48	10.30	16.91	34.25	3.96	13.46	-8.72	81.77
Total	129.21	150.02	138.44	168.24	65.67	182.01	76.19	81.79	820.01	2472.55

Table A2: Macroeconomic Social Accounting Matrix for the U.S., 1982
(billion dollars)

Receipts	Sum	Low 21	Medium 22	High 23	Sum	Cptl 24	Govt 25	World 26	Total
1 Dairy & meat	70.77	1.79	2.69	1.80	6.27	0.37	0.37	0.20	77.98
2 Grains	47.43	0.14	0.36	0.36	0.86	-0.43	6.76	17.46	72.08
3 Other agriculture	35.34	3.33	5.39	4.56	13.28	-0.16	1.15	1.75	51.36
4 Mining	390.79	12.94	27.66	20.29	60.89	-1.97	11.13	22.34	483.18
5 Construction	90.98	0.00	0.00	0.00	0.00	228.41	80.35	0.04	399.77
6 Food	117.32	45.11	75.42	52.20	172.72	-0.73	6.52	14.21	310.03
7 Textiles	45.02	1.49	3.39	3.69	8.56	0.55	0.72	2.40	57.25
8 Wood & paper	176.02	7.55	15.25	14.63	37.43	7.10	12.56	9.30	242.40
9 Chemicals	168.15	8.74	14.74	12.16	35.64	-0.16	8.51	19.32	231.47
10 Apparel & footwear	17.11	12.25	24.01	25.78	62.05	-0.91	1.44	1.70	81.39
11 Metals	122.49	0.00	0.01	0.01	0.03	-0.65	0.61	6.73	129.21
12 Other industry	129.51	1.20	2.42	2.55	6.17	3.10	3.68	7.56	150.02
13 Machines	67.24	0.25	0.49	0.49	1.23	41.96	4.72	23.30	138.44
14 Electric 1	73.15	0.97	1.90	1.92	4.78	47.61	20.19	22.51	168.24
15 Electric 2	23.25	4.57	9.16	8.15	21.88	9.16	3.83	7.55	65.67
16 Vehicles	53.36	8.44	26.25	28.03	62.72	37.78	13.35	14.80	182.01
17 Aviat & munitions	18.87	0.30	0.58	0.60	1.49	5.16	31.07	19.60	76.19
18 Scientific equipment	29.21	6.95	17.08	15.87	39.89	-4.47	9.32	7.84	81.79
19 Trade & finance	318.07	89.18	175.28	171.35	435.81	29.14	17.72	19.27	820.01
20 Other services	898.35	233.53	400.55	379.12	1013.19	13.98	416.50	130.53	2472.55
Sum	2892.39	438.72	802.62	743.55	1984.89	414.86	650.47	348.43	6291.04
21 Low 40% households	230.90	0.00	0.00	0.00	0.00	0.00	209.95	-0.18	440.67
22 Medium 40 % households	901.36	0.00	0.00	0.00	0.00	0.00	115.09	-0.51	1015.95
23 High 20% households	1005.12	0.00	0.00	0.00	0.00	0.00	63.22	-0.48	1067.86
Sum	2137.37	0.00	0.00	0.00	0.00	0.00	388.26	-1.16	2524.47
24 Capital account	364.78	-18.76	56.86	97.40	135.50	0.00	-91.97	6.55	414.86
25 Government	567.10	20.71	156.47	226.90	404.08	0.00	183.15	-24.42	1129.91
26 Rest of the world	329.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	329.40
Total	6291.04	440.67	1015.95	1067.86	2524.47	414.86	1129.91	329.40	